

Jefferson County Barrier Culvert Inventory and Prioritization Final Report

WDFW
Habitat Program
Environmental Restoration Division
Salmonid Screening, Habitat Enhancement
and Restoration Section
(SSHEAR)

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**FISH and
WILDLIFE**

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INTRODUCTION

Salmonids have been an esteemed natural resource, rich in food value and spiritual significance, throughout the history of the Northwest. In recent years, salmonids have become an icon for this region, symbolic of its high quality environment, abundant natural resources and outdoor life style. Salmonids require a high quality natural habitat and are considered indicator species (“the canary in the coal mine”) for the health of our streams. In 1994, the Washington Salmon Industry experienced, for the first time in its history, a coast-wide fishing closure to protect Pacific salmon stocks too weak in numbers to support harvest. This, along with the listing of Puget Sound and Columbia River chinook and chum salmon stocks under the federal Endangered Species Act and the classification of many other salmon stocks as “critical”, has profiled concerns for the future of our salmonid resource.

The roots of the salmonid “problem” have centered on three causes; 1) a long history of overfishing without regard for impacts to individual salmon stocks, 2) massive destruction and fragmentation of habitat units from land conversion, urbanization, logging, agriculture, dams, and road building, and 3) genetic weakening of individual stocks through hatchery stocking practices. These issues are not new to those who have fought to protect against the progressive decline of Northwest salmonid populations. Loss of habitat viability and associated impacts to our salmonid stocks may be irreversible in streams converted to urban run off or pooled by hydro power dams. Conversely, significant resource gains can occur by restoration and protection of flood plain and riparian areas, improved fishery management and forest practices, if public will demands it. (Adapted from Cowan, L., et al., 1995)

Restoration can be as simple as restoring access to productive habitat blocked by human-made fish passage barriers such as road culverts, dams, floodgates, fishways or weirs. Correction of these barriers is one cost-effective method of salmonid habitat enhancement and restoration. In Jefferson County, inventories have identified 91 miles of productive stream habitat partially or wholly inaccessible due to impassable culverts. The correction of human-made fish passage barriers is mandated by the following State laws, RCW 75.20.060, RCW 75.20.061, RCW 77.16.210, and RCW 77.12.425 (for complete language see Appendix A).

In January of 1997, WDFW and Jefferson County entered into an agreement for a comprehensive fish passage barrier inventory and correction program (Letters of Agreement - Appendix B). Subsequently, WDFW conducted an inventory of county-owned roads to identify barriers to fish passage, verify passage up to each barrier, identify additional barriers and to measure the quantity of the upstream habitat to be gained by reestablishing access. The product of the inventory is a priority index (PI) used to prioritize barrier correction efforts (*Fish Passage Barrier Assessment and Prioritization Manual*, WDFW 1998). The PI is a general guideline to be used with other relevant factors to select projects that are mutually acceptable for correction. WDFW conducted the inventory at no cost to Jefferson County.

To facilitate barrier correction, WDFW offered \$50,000 annually for work on Jefferson County owned barriers. This money was offered on a 50% cost share arrangement where WDFW would provide project design, permitting, and construction work and Jefferson County would reimburse WDFW for 50% of the project cost, up to \$50,000 annually, subject to the availability of funds. This arrangement

is not intended to be permanent, but a “jump-start” to allow the County an opportunity to learn how to address fish passage and to budget for future barrier correction. In addition to the dedicated funding the County agreed to integrate barrier correction into its road planning activities so as to correct barriers during road maintenance and construction work. Maintenance of completed fish passage structures becomes the responsibility of the county.

SITE DESCRIPTION

Jefferson County spans the Olympic Peninsula from the Pacific Ocean to Hood Canal. Olympic National Park splits the county into two parts, referred to here as West Jefferson County and East Jefferson County. The county road inventory did not include roads on private, tribal, state or federal land. Culverts encountered during the subsequent physical surveys, however, were recorded and evaluated regardless of ownership.

West Jefferson County contains most of the Hoh and Queets river systems and a small portion of the Bogachiel and Quinault river systems. There are few county roads, the main ones being Upper Hoh, Oil City, Clearwater, South Shore Quinault, Undie and Dowans Creek roads. Since these roads parallel the Hoh, Bogachiel, Clearwater and Quinault Rivers all barrier culverts were on tributaries to these river systems.

These tributaries provide spawning and rearing habitat for coho salmon, steelhead, cutthroat and bull trout and provide refuge for juvenile salmonids when the rivers are inhospitable due to high winter flows. Rainfall ranges from 90 to 200 inches per year, most of which occurs in the fall, winter and spring, so many of these tributaries have high flows in the winter and are dry in the summer.

East Jefferson County extends from about the Duckabush River north to Port Townsend and from the Olympic National Forest boundary east to Hood Canal. The main river systems are the Duckabush, Dosewallips, Big Quilcene and Little Quilcene. The largest creeks with barrier culverts are Chimacum, East Chimacum, Naylor’s, Tarboo, East Fork Tarboo, Thorndyke, Ludlow, Penny and Spencer creeks. Species found in these creeks include coho, chum, pink, chinook salmon and steelhead and cutthroat trout. Rainfall ranges from 20 to 80 inches per year.

METHODS

Culvert Inventory

Rather than driving every mile of Jefferson County roads, a more systematic approach was used to inventory only those roads that potentially have fish bearing streams crossing them. Jefferson County provided a list of known culverts. Map overlays were used to locate other potential stream crossings. Combining overlays of streams and roads revealed where fish bearing streams crossed county roads. These roads were then added to the road inventory list (Appendix C).

A *site* is a location where a road crosses over water. It can have one or more culverts, each identified with an individual sequence number. The following pertains to sites, not individual culverts.

Each road in the road inventory list was driven and all sites found were recorded, given a Site ID number, and logged into a global positioning system (GPS) unit with the road name and milepost. The stream was then identified as either fish bearing or non-fish bearing based on information from the *Catalog of Washington Streams and Salmon Utilization* (Williams, et al., 1975, Phinney and Bucknell, 1975), DNR stream typing maps, observation of fish or professional judgement of physical characteristics.

For the culvert inventory and all physical surveys completed prior to February 1, 1998, the upper gradient limit for fish use was 12%, based on the forest practices board manual (WAC 222-12-090). The Forest Practices Board Emergency Rule for the water typing system increased the gradient limit for fish use to 20% based on new scientific information on fish distribution documenting fish use in streams. This may have resulted in some streams that were greater than 12% gradient but less than 20% being identified as non-fish bearing during the initial culvert evaluation process. Four physical surveys completed before February 1, 1998, may have been ended prematurely due to this change as well. All four ranked lower than #44 in the PI list, (see Table 2). All physical surveys after February 1, 1998, went to 20% gradient.

For location verification and mapping purposes, the position of each culvert was recorded utilizing the global positioning system (GPS). A Trimble Pathfinder Pro XL equipped with a TDC1 data logger was used to collect the GPS positions. GPS positions were differentially corrected using Trimble's Pathfinder software and base files obtained from the Thurston County community base station.

Culvert Evaluation

Culverts on fish bearing streams were evaluated for fish passability based on professional judgement. Factors taken into consideration included culvert condition, diameter, length, slope, water depth inside the culvert (sheet flow), outfall drop, high velocity indicators (large plunge pool), inlet conditions, and species utilization. The culvert was given an estimate of passability according to the percentage of time it was likely to be passable, using four percentages, 0%, 33%, 66% or 100% passable. Data collected on passable culverts included culvert shape, material, diameter, length and interior coating and any maintenance needs were noted. Additional data collected on barrier culverts can be found in Appendix D.

All dimensions were measured in English units to the nearest tenth of a foot with a stadia rod or tape measure. Culvert slope and stream gradients were measured using a Suunto Model PM-5/360 PC clinometer. Data were recorded using a Trimble Pathfinder Pro XL equipped with a TDC1 data logger. Field data were processed into ASCII text files via Trimble's Pathfinder software and imported into a Paradox database for information management.

The culvert evaluation protocol changed on December 1, 1998, to include a Level A and Level B (hydraulic analysis) protocol. This replaced the professional judgement evaluation used prior to then.

The change occurred during the physical survey process and was primarily used for non county-owned culverts. The level A analysis identified culverts with streambed material throughout and a span of at least 75% of the streambed toe width as passable; and culverts not having streambed material throughout, and either a slope greater than 1% or an outfall drop greater than 0.24m (0.80ft) as barriers. Any culvert not meeting these criteria required a Level B hydraulic analysis described in the *Fish Passage Barrier Assessment and Prioritization Manual* (WDFW 1998). A laser level was used for culvert length, slope, and Level B measurements.

Habitat Assessment and Data Analysis

Habitat assessment followed the procedures outlined in the *Fish Passage Barrier Assessment and Prioritization Manual* (WDFW 1998) for a full physical survey. The manual can be found on the WDFW agency website at www.wa.gov/wdfw/hab/engineer/fishbarr.htm.

RESULTS AND DISCUSSION

A total of 1180 county road sites were evaluated in the road inventory for Jefferson County. Of these, 246 sites affect fish bearing streams, of which 122 are total or partial barriers to fish passage, (Table 1). Of the 122 barrier sites, 84 require repair (42 total barriers and 42 partial barriers). Thirty-one sites have a “No Gain” status which indicates insufficient habitat gain, (< 200m of stream length), and seven barrier sites were “Fixed” during the inventory and physical survey process. Seventy-three of the sites are barriers to anadromous salmonids and 11 sites are barriers to resident salmonids only.

An additional 251 sites were evaluated during the physical surveys and the WSDOT road inventory for a total of 1431 sites. Of the 251 non county-owned sites, 131 are barriers to fish. Ownership of the non county-owned sites includes private, state and federal.

Downstream checks and physical habitat surveys were completed for 118 sites (122 barrier sites minus 4 that were fixed before the physical surveys were done) owned by Jefferson County covering approximately 142 linear miles of stream. Physical surveys, completed for the 84 barriers requiring repair, revealed 109 miles of stream are partially or wholly inaccessible due to impassable culverts. The total habitat blocked by these barriers is 111,272 m² of spawning habitat and 1,264,526 m² of rearing habitat.

In west Jefferson county, all the streams surveyed from the barrier culvert upstream were too small for chinook and too steep for chum salmon. The largest creeks surveyed were Dismal, Spruce, Canyon, Cassel, Snell, Pole and Donkey creeks.

In east Jefferson county, the majority of the barrier culverts are located on Chimacum, East Chimacum, Naylor's, Tarboo, East Fork Tarboo, Thorndyke, Ludlow, Penny and Spencer Creeks. Not surprisingly, they comprise most of the highest priority barrier culverts. Interestingly, 4 of 11 unnamed streams flowing into Hood Canal ranked among the 20 highest priority barriers. These creeks collectively

provide a large amount of habitat for chum and coho salmon, steelhead and cutthroat trout. Pink and chinook salmon are limited to the lower portions of a few streams.

Table 1. Number of sites evaluated and their barrier status based on ownership.

	Jefferson County Sites	Non- County- Owned Sites	Total Sites
Sites Evaluated	1180	251	1431
Sites on Non-Fish Bearing Streams	934	29	963
Sites on Fish Bearing Streams	246	222	468
Passable Sites on Fish Bearing Streams	124	91	215
Barrier Sites on Fish Bearing Streams	122	131	253
▶Barriers Requiring Repair	84	94	178
▶No Gain	31	31	62
▶Fixed	7	6	13

Maps for east and west Jefferson County can be found in Appendix F that show the locations of the 84 county-owned and 94 non county-owned sites requiring repair. The Site ID numbers shown on the maps are WDFW reference numbers used to track the culverts in the inventory database. They are also included in Tables 2 and 3 for reference purposes.

Table 2 is a prioritized list of all the county road barrier culvert sites sorted by PI, (priority index) in descending order. It also shows the total amount (m²) of spawning and rearing habitat available upstream of each barrier site, the passability of the culvert, the stream length, the fish species expected to utilize the stream and the number of additional human-made barriers. The habitat gains listed reflect the total potential production habitat for the barrier site regardless of additional human-made barriers upstream. It is assumed that all human-made barriers will be corrected so that the full gain will be realized.

Priority index values were generated for barrier sites with significant habitat gain. The PI should be regarded as a dynamic index as it can change as new information becomes available and inputs are refined. These values are intended as guides to aid in prioritizing projects. Other factors can and need to be considered when selecting projects, including additional barriers that must be corrected to achieve predicted habitat gains.

BARRIER CORRECTION

Seven Jefferson County barrier culverts have been replaced with passable culverts since 1997 (Table

3). Of these, three were cooperative projects completed on a cost share basis between WDFW and Jefferson County. One project was completed on an unnamed tributary to the Hoh River on Oil City Road at milepost 6.0 in 1998. In 1999, two projects were completed - one on East Fork Tarboo Creek and the other on North Branch, East Fork Tarboo Creek.

Unnamed Tributary to Hoh River

This project replaced a barrier culvert at milepost 6 on Oil City Road. The 6 foot diameter culvert at this site was 80 feet long and had a 4% slope. Fish passage was blocked to salmonids by a 5 foot outfall drop and high velocities inside the culvert. The project involved the removal of the existing culvert and replacing it with a 12 foot diameter structural plate aluminum culvert with a roughened channel constructed inside.

Fish passage was restored to 1.6 miles of spawning and rearing habitat for coho salmon and steelhead and cutthroat trout. Construction labor and equipment were provided by the SSHEAR Construction Unit. WDFW contributed \$171,400 and the Washington State Fish Passage Grant Program contributed \$240,400 to this project.

East Fork Tarboo Creek

Located at milepost 0.42 on Coyle Road, a 6' diameter culvert was replaced with a 13'-1" wide x 8'-2" high structural plate aluminum, squash culvert. Fish passage was partially blocked at this location because of a 2% slope in the culvert and an inadequate fishway downstream of the culvert. This project, in conjunction with three projects upstream will open up 4.2 miles of habitat to chum and coho salmon and steelhead and cutthroat trout. This project was constructed by the SSHEAR Construction Unit. Jefferson County contributed \$52,000, WDFW contributed \$46,000, and the Salmon Funding Recovery Board contributed \$90,000 to this project.

North Branch East Fork Tarboo Creek

This project was located at milepost 0.7 on Coyle Road. A 3' diameter culvert was replaced with a 10'-6" wide x 5'-7" high structural plate aluminum, bottomless arch culvert. Fish passage was blocked at this location because of the steep slope in the culvert and a 2' outfall drop at the downstream end of the culvert. This project restored access to 1.2 miles of habitat for coho salmon and steelhead and cutthroat trout. Construction of the project was accomplished by the SSHEAR Construction Unit. WDFW contributed \$37,600 and the Salmon Funding Recovery Board contributed \$112,800 to this project.

FUTURE WORK

Two projects have been selected for year 2001 construction. The Tarboo Creek crossings at Dabob Road and Center Road will be corrected. Candidate projects for 2002 include Thorndyke Creek at Thorndyke Road and Chimacum Creek at Eaglemount Road.

Table 2 (Continued) County barrier culvert sites prioritized in descending order.

PI Rank	PI Total	WRIA #	Site ID	Road Name	Mile Post	Stream Name	Tributary To	Fish Species ¹	Fish passage (%)	Stream Length (meters)	Spawning Area (square meters)	Rearing Area (square meters)	Downstream Barriers	Upstream Barriers
1	39.08	17.0129	160269	Center Rd	7.65	Tarboo Cr	Tarboo Bay	CH/CO/SH/CT	0	8,163	4,387	114,295	2	5
2	39.04	17.0170	160508	Thorndyke Rd	4.71	Thorndyke Cr	Hood Canal	CH/CO/SH/CT	67	24,464	24,364	333,055	0	12
3	35.78	17.0129	160213	Dabob Rd	0.04	Tarboo Cr	Tarboo Bay	CH/CO/SH/CT	67	8,332	4,703	114,603	1	6
4	32.76	17.0129	160331	Old Tarboo Rd	0.9	Tarboo Cr	Tarboo Bay	CH/CO/SH/CT	67	10,744	8,285	119,763	0	7
5	32.32	17.0203	160714	Eaglemount Rd	4.92	Chimacum Cr	Port Townsend Bay	CO/SH/CT	0	16,247	7,633	139,977	2	12
6	30.85	17.0180	160497	Thorndyke Rd	1.89	Unnamed	Hood Canal	CH/CO/SH/CT	33	4,027	604	103,326	0	1
7	30.55	17.0014	162090	Fish Hatchery Rd	0.1	Penny Cr	Big Quilcene R	CO/SH/CT	0	10,966	9,927	128,124	0	14
8	30.06	17.0014	160108	Big Quilcene River Rd	0.17	Penny Cr	Big Quilcene R	CO/SH/CT	0	8,678	7,223	119,852	1	10
9	26.91	17.0208	160756	West Valley Rd	2.59	Naylors Cr	Chimacum Cr	CO/SH/CT	67	6,146	2,847	203,011	0	5
10	26.81	17.0130	160549	Coyle Rd	1.15	EF Tarboo Cr	Tarboo Cr	CH/CO/SH/CT	0	3,453	3,563	11,040	1	2
11	25.97	17.0208	162127	Gibbs Lake Rd	1.82	Naylors Cr	Chimacum Cr	CO/SH/CT	67	1,585	59	175,969	2	0
12	25.48	17.0203	160253	Center Rd	3.26	Chimacum Cr	Port Townsend Bay	CO/SH/CT	67	24,873	10,832	163,870	1	17
13	23.29	17.0118	160291	Center Rd	13.59	Unnamed	Donovan Cr	CO/SH/CT	0	1,310	585	43,195	1	1
14	21.98	17.0014	160154	Penney Creek Rd	2.97	Penny Cr	Quilcene R	CO/SH/CT	67	5,828	3,312	103,715	2	7
15	21.12	17.0167	160513	Thorndyke Rd	6.17	Unnamed	Thorndyke Bay	CH/CO/SH/CT	33	3,665	3,033	5,036	1	1
16	20.10	16.0351x	160005	Duckabush Rd	0.6	Unnamed	Duckabush River	CH/PK/CO/SH/CT	33	878	441	890	0	4
17	19.58	17.0191	160626	Paradise Bay Rd	0.72	Unnamed	Hood Canal	CO/SH/CT	0	850	265	18,781	0	2
18	18.89	17	160616	Shine Rd	1.1	Unnamed	Squamish Harbor	CH/CO/SH/CT	0	1,498	1,349	1,971	1	3
19	17.68	17.0130	160550	Coyle Rd	1.23	EB EF Tarboo CR	Tarboo Cr	CH/CO/SH/CT	0	1,198	1,453	1,706	2	1
20	17.39	17.0192	160625	Paradise Bay Rd	0.35	Ludlow Cr	Hood Canal	CH/CK/CO/SH/CT	33	3,531	1,229	8,336	0	15
21	15.15	17.0004	160096	Bee Mill Rd	0.62	Spencer Cr	Dabob Bay	CH/CO/SH/CT	67	790	975	3,644	0	0
PI Rank	PI Total				Mile Post				Fish passage (%)	Stream Length (meters)	Spawning Area (square meters)	Rearing Area (square meters)	Downstream Barriers	Upstream Barriers

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Table 2. (Continued)

22	14.52	17.0078	160421	Leland Valley Rd W	3.12	Unnamed	Leland Cr	CH/CO/SH/CT	0	1,900	790	1,301	1	0
23	14.18	20.0461	161128	Upper Hoh Rd	9.19	Dismal Cr	Hoh R	CO/SH/CT/DB	33	2,886	2,595	6,269	0	3
24	13.85	20	160978	Oil City Rd	0.52	Unnamed	Hoh R	CH/CO/SH/CT/DB	0	842	1,107	1,290	0	1
25	13.76	17.0166	160514	Thorndyke Rd	7.16	Unnamed	Thorndyke Bay	CH/CO/SH/CT	0	2,166	1,050	1,360	1	1
26	13.70	17.0203	160700	Eaglemount Rd	1.75	Chimacum Cr	Port Townsend Bay	CO/SH/CT	33	650	0	6,712	3	0
27	12.54	20.0448x	161089	Upper Hoh Rd	2.15	Unnamed	Alder Cr	CO/SH/CT/DB	33	6,888	4,410	9,375	0	3
28	11.99	17.0150	160588	Coyle Rd	14.38	Unnamed	Fisherman Harbor	CH/CO/SH/CT	67	3,921	1,887	4,542	0	13
29	11.42	20.0465	161129	Upper Hoh Rd	9.68	Spruce Cr	Hoh R	CO/SH/CT/DB	67	2,600	2,575	7,436	0	1
30	11.21	17.0205	160744	Egg & I Rd	2.94	E Chimacum Cr	Chimacum Cr	CO/SH/CT	67	6,725	2,994	6,104	0	4
31	10.93	17.0200A	160814	Oak Bay Rd	0.71	Little Goose Cr	Oak Bay	CO/SH/CT/RB	33	869	504	1,390	0	1
32	10.93	20.0438	161001	Oil City Rd	3.67	Cassel Cr	Hoh R	CO/SH/CT/DB	0	1,434	749	1,762	0	1
33	10.25	20.0449	161092	Upper Hoh Rd	2.76	Snell Cr	Alder Cr	CO/SH/CT/DB	0	1,454	335	1,380	0	2
34	9.79	20.0426a	161058	Oil City Rd	8.36	Unnamed	Hoh R	CO/SH/CT/DB	0	1,029	743	1,334	0	0
35	9.79	20.0460	161124	Upper Hoh Rd	8.3	Pole Creek	Hoh R	CO/SH/DB/CT	33	1,999	1,314	2,056	0	0
36	9.53	17.0200	160844	Oak Bay Rd	5.52	Unnamed	Mats Mats Bay	CO/SH/CT	33	1,297	1,147	1,569	0	2
37	9.50	16.0352	160026	Elk Dr	0.33	Unnamed	Duckabush R	CO/SH/CT	0	953	1,432	1,744	0	2
38	9.39	17.0185	160617	Shine Rd	1.21	Unnamed	Squamish Harbor	CO/SH/CT	67	2,310	441	2,726	1	5
39	9.30	20.0024x	160922	Clearwater Rd	1.31	Donkey Cr	Clearwater R	CO/SH/CT/DB	33	2,263	1,272	2,949	0	1
40	9.18	17.0203c	160705	Eaglemount Rd	3.11	Unnamed	Chimacum Cr	CO/CT/SH	67	2,778	39	2,742	4	1
41	9.17	20.0425a	161061	Oil City Rd	8.76	Ruby Cr	Hoh R	CO/SH/CT/DB	67	2,397	1,311	5,417	0	1
42	9.07	20.0427	161046	Oil City Rd	7.43	Unnamed	Hoh R	CO/SH/DB/CT	33	1,355	369	1,264	0	2
PI Rank	PI Total	WRIA #	Site ID	Road Name	Mile Post	Stream Name	Tributary To	Fish Species ¹	Fish pass %	Stream Length (meters)	Spawning Area (square meters)	Rearing Area (square meters)	Downstream Barriers	Upstream Barriers
43	8.10	20.0422x	161041	Oil City Rd	6.76	Unnamed	Hoh R	CO/CT/SH/DB	33	1,237	254	825	1	1

Table 2. (Continued)

44	8.09	17.0121	160176	East Quilcene Rd	2.	Unnamed	Quilcene Bay	CO/SH/CT	0	808	915	876	0	0
45	8.01	17.0192a	160864	Oak Bay Rd	9.06	Unnamed	Ludlow Cr	SH/CT	0	2,829	711	7,325	2	12
46	7.99	20.0470	161133	Upper Hoh Rd	10.20	Canyon Cr	Hoh R	SH/CT/DB	33	1,491	1,672	3,871	0	0
47	7.93	17.0150	160425	Thousand Trails Rd	0.10	Unnamed	Fisherman Harbor	CO/SH/CT	0	597	480	580	1	2
48	7.76	17.0200	162202	Bayshore Rd	0.43	Unnamed	Mats Mats Bay	CO/SH/CT	0	426	207	462	1	1
49	7.02	17.0004x	160097	Bee Mill Rd	0.73	Unnamed	Dabob Bay	CO/SH/CT	0	474	280	432	1	0
50	7.00	20	160991	Oil City Rd	2.67	Unnamed	Hoh R	CO/SH/CT/DB	33	542	143	174	2	1
51	6.96	17	162182	South Point Rd	1.19	Unnamed	Squamish Harbor	CO/SH/CT	0	580	359	616	2	1
52	6.74	17.0213	160264	Center Rd	6.35	Unnamed	Chimacum Cr	CO/SH/CT	67	756	533	797	0	1
53	6.71	17.0150	162015	Zelatched Point Rd	0.39	Unnamed	Fishermans Harbor	CO/SH/CT	0	422	457	278	3	0
54	6.70	20.0024a	160923	Clearwater Rd	1.38	Unnamed	Donkey Cr.	CO/SH/CT/DB	67	234	0	761	0	0
55	6.68	17.0170x	160510	Thorndyke Rd	5.14	Unnamed	Thorndyke Cr	CO/SH/CT	33	552	233	414	0	1
56	6.56	20.0162x	160958	Dowans Creek Rd	1.16	Unnamed	Bogachiel R	SH/CT/DB	0	720	336	1,158	0	0
57	6.46	20	161105	Upper Hoh Rd	4.37	Unnamed	Hoh R	SH/DB/CT	33	2,146	720	1,628	0	2
58	6.35	17.0129X	160299	Carl Johnson Rd	0.08	Unnamed	Tarboo Cr	CO/SH/CT	33	318	141	545	0	1
59	5.84	17.0129a	162145	Thoren Rd	0.03	Unnamed	Ludlow Cr	SH/CT	67	1,052	7	5,844	6	8
60	5.28	17.0192a	162157	Reuben Johnson Rd	0.20	Unnamed	Ludlow Cr	CT/SH	0	147	1	1,285	12	2
61	5.13	17.0150c	160427	Thousand Trails Rd	0.29	Unnamed	Fisherman Harbor	SH/CT	0	310	190	1,515	1	1
62	5.11	17.0221	162100	Snow Creek Rd	3.83	Andrews Cr	Snow Cr	CT	0	5,955	4,433	8,897	1	3
63	5.08	16.0352	160029	Elk Dr	0.49	Unnamed	Duckabush R	SH/CT	0	619	771	1,105	1	0
PI Rank	PI Total	WRIA #	Site ID	Road Name	Mile Post	Stream Name	Tributary To	Fish Species ¹	Fish pass %	Stream Length (meters)	Spawning Area (square meters)	Rearing Area (square meters)	Downstream Barriers	Upstream Barriers
64	5.00	17.0247b	160440	W. Uncas Rd	0.78	Unnamed	Salmon Cr	CO/SH/CT	0	480	47	71	1	1
65	4.90	17.0140a	160321	Dabob Post Office Rd	1.71	Unnamed	Tarboo Bay	CO/SH/CT	33	398	130	290	0	0

Table 2. (Continued)

66	4.38	17.0129x	160235	Dabob Rd	4.43	Unnamed	Tarboo Cr	SH/CT	0	711	345	794	0	1
67	3.88	20.0422x	160998	Oil City Rd	3.01	Unnamed	Hoh R	CT/DB	0	690	374	870	1	1
68	3.79	17.0129j	160667	Dabob Rd	3.39	Unnamed	Tarboo Cr	CT/SH	0	267	67	449	1	0
69	3.79	20.0162x	160937	Undie Rd	1.08	Unnamed	Bogachiel R	SH/DB/CT	0	310	85	194	0	1
70	3.77	17.0016	161156	Penney Creek Rd	3.43	Unnamed	Penny Cr	SH/CT	0	280	130	177	0	1
71	3.65	17.0195	160608	Larson Lake Rd	4.00	Unnamed	Ludlow Cr	CT	67	5,161	235	7,282	2	5
72	3.40	17.0192b	160867	Oak Bay Rd	9.41	Unnamed	Ludlow Cr.	CT	0	1,542	1,334	1,804	1	1
73	3.33	16.0351a	160011	Duckabush Rd	2.03	Unnamed	Duckabush R	CT	0	926	680	1,583	0	1
74	3.14	17.0150a	162013	Zelatched Point Rd	0.04	Unnamed	Fishermans Harbor	SH/CT	0	655	283	184	1	2
75	3.05	17.0133a	160278	Center Rd	9.80	Unnamed	Tarboo Cr	SH/CT	0	491	77	187	0	0
76	2.70	17.0195	162080	Embodry Rd	0.30	Unnamed	Ludlow Cr	CT	67	3,160	51	2,162	2	1
77	2.55	17.0092	160490	Lords Lake Loop Rd	4.43	Lords Lake Outlet	Howe Cr	CT	67	1,346	571	1,735	2	3
78	2.54	20.0000	160934	Undie Rd	0.89	Unnamed	Bogachiel R	CT/DB	0	315	33	159	1	1
79	2.35	20	161107	Upper Hoh Rd	4.59	Unnamed	Hoh R	CT/DB	0	250	32	118	0	0
80	2.32	16.0355	160016	Duckabush Rd	2.92	Unnamed	Duckabush R	CT	33	269	176	586	0	0
81	2.31	16.0356	160013	Duckabush Rd	2.46	Unnamed	Duckabush R	CT	0	308	251	382	3	0
82	2.25	17.0213c	160267	Center Rd	6.93	Unnamed	Chimacum Cr	SH/CT	0	481	256	369	1	1
83	1.87	17.0090	160350	Lords Lake Loop Rd	2.92	Howe Cr	Little Quilcene R	CT	67	229	188	994	1	4
84	1.84	17.0197	160606	Larson Lake Rd	3.66	Unnamed	Ludlow Cr	CT	67	1,000	66	473	2	1

¹. Fish species abbreviations:

- CH - chum salmon
- PK - pink salmon
- CO - coho salmon
- CK - chinook salmon
- SO - sockeye salmon
- SH - steelhead trout
- CT - cutthroat trout

RB - rainbow trout
 DB - dolly/bull trout
 EB - eastern brook trout
 BT - brown trout

Table 3. Jefferson County Fish Passage Projects completed from 1997 through 1999.

Site ID	WRIA	Road Name	Mile Post	Stream Name	Tributary To	PI Total	Spawning Area m ²	Rearing Area m ²
160165	17.0011	Linger Longer Rd	1.27	Indian Cr	Quilcene Bay			
160318	17.	Dabob Post Office Rd	1.43	Unnamed	Tarboo Bay			
160543	17.0130	Coyle Rd	0.42	East Fork Tarboo Cr	Tarboo Cr	35.28	8,437	19,852
160544	17.0131	Coyle Rd	0.70	North Branch of East Fork Tarboo Cr	Tarboo Cr	17.07	2,179	6,236
160974	20.0426	Lower Hoh Rd	0.99	Fletcher Cr	Hoh River	20.57	1,907	21,971
161030	20.0429	Oil City Rd	5.98	Unnamed	Hoh River	14.16	1,560	5,235
17.0200 A 0.02	17.0200A	Hiller Rd	1.27	Unnamed	Oak Bay			

REFERENCES

Cowan, L., D King, C. Detrick. 1995. Wild Salmonid Habitat Enhancement and Restoration Project. Washington Department of Fish and Wildlife. Habitat Program. Salmonid Screening, Habitat Enhancement and Restoration Division. Olympia. 48 pp.

Phinney, L. A., and P. Bucknell.. 1975. A catalog of Washington streams and salmon utilization. Vol. 2 - Coastal Region. Wash. Dept. Fish. Olympia. 974 pp.

Washington Department of Fish and Wildlife. Olympia., Habitat and Lands Services Program, Salmonid Screening, Habitat Enhancement and Restoration Division. October 1998. Fish Passage Barrier Assessment and Prioritization. Manual. 57 pp.

Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington treaty Indian Tribes. 1993. 1992 Washington State Salmon and Steelhead Stock Inventory. Olympia. 212 pp.

Williams, R.W., R.M. Laramie, and J.J. Ames. 1975. A catalog of Washington streams and salmon utilization. Vol. 1 - Puget Sound. Wash. Dept. Fish. Olympia. 974 pp.

APPENDIX A

RCW 75.20.060

RCW 75.20.061

RCW 77.16.210

RCW 77.12.425

RCW 75.20.060 Fishways required in dams, obstructions, - Penalties, remedies for failure. A dam or other obstruction across or in a stream shall be provided with a durable and efficient fishway approved by the director. Plans and specifications shall be provided to the department prior to the director's approval. The fishway shall be maintained in an effective condition and continuously supplied with sufficient water to freely pass fish. It is unlawful for the owner, manager, agent, or person in charge of the dam or obstruction to fail to comply with this section.

If a person fails to construct and maintain a fishway or to remove the dam or obstruction in a manner satisfactory to the director, then within thirty days after written notice to comply has been served upon the owner, his agent, or the person in charge, the director may construct a fishway or remove the dam or obstruction. Expenses incurred by the department constitute the value of a lien upon the dam and upon the personal property of the person owning the dam. Notice of the lien shall be filed and recorded in the office of the county auditor of the county in which the dam or obstruction is situated. The lien may be foreclosed in an action brought in the name of the state.

If, within thirty days after notice to construct a fishway or remove a dam or obstruction, the owner, his agent, or the person in charge fails to do so, the dam or obstruction is a public nuisance and the director may take possession of the dam or obstruction and destroy it. No liability shall attach for the destruction. (1983 1st ex.s. c 46 § 72; 1955 c 12 § 75.20.060. Prior: 1949 c 112 § 47; Rem. Supp. 1949 § 5780-321.)

RCW 75.20.061 Director may modify inadequate fishways and fish guards. If the director determines that a fishway or fish guard described in RCW 75.20.040 and 75.20.060 and in existence on September 1, 1963, is inadequate, in addition to other authority granted in this chapter, the director may remove, relocate, reconstruct, or modify the device, without cost to the owner. The director shall not materially modify the amount of flow of water through the device. After the department has completed the improvements, the fishways and fish guards shall be operated and maintained at the expense of the owner in accordance with RCW 75.20.040 and 75.20.060. (1983 1st ex.s. c 46 § 73; 1963 c 153 § 1.)

RCW 77.16.210 Fishways to be provide and maintained. Persons or government agencies managing, controlling, or owning a dam or other obstruction across a river or stream shall construct, maintain, and repair durable fishways and fish protective devices that allow the free passage of game fish around the obstruction. The fishways and fish protective devices shall be provided with sufficient water to insure the free passage of fish. (1980 c 78 § 88; 1955 c 36 § 77.16.020. Prior: 1947 c 275 § 60; Rem. Supp. 1947 § 5992-69.)

RCW 77.12.425 Director may modify inadequate fishways and protective devices. The director may authorize removal, relocation, reconstruction, or other modification of an inadequate fishway or fish protective device required by RCW 77.16.210 and 77.16.220 which device was in existence on September 1, 1963, without cost to the owner for materials and labor. The modification may not materially alter the amount of water flowing through the fishway or fish protective device. Following modification, the fishway or fish protective device shall be maintained at the expense of the person or governmental agency owning the obstruction or water diversion device. (1980 c 78 § 90; 1963 c 152 § 1. Formerly RCW 77.16.221.)

APPENDIX B

Letters of Agreement Between WDFW and Jefferson County



State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: 600 Capitol Way N, Olympia, WA 98501-1091 - (206) 902-2200; TDD (206) 902-2207
Main Office Location: Natural Resources Building, 1111 Washington Street SE, Olympia, WA

October 29, 1996

Klara A. Fabry, P.E.
Jefferson County Public Works Director/County Engineer
Post Office Box 2070
1322 Washington Street
Port Townsend, Washington 98368

Dear Ms. Fabry:

SUBJECT: Jefferson County Owned Fish Passage Barrier Inventory and Correction Program Proposal

As you are aware there is an increasing interest and awareness about manmade barriers to fish associated with road crossings of our streams throughout the state. In our current efforts to identify barriers to fish associated with State highways we found that of the 1,333 culverts inspected, 340 were significant barriers to fish migration blocking valuable freshwater salmonid production areas. We currently have active barrier correction efforts underway in Skagit, Kitsap, Thurston and Snohomish Counties and would like to work with Jefferson County (County) to identify and correct County owned barriers to fish migration in a cooperative effort similar to our State Department of Transportation (WSDOT) program. I have enclosed a copy of our January 1995 progress report for the WSDOT fish passage effort for your information. Please accept this letter as a proposal to develop a cooperative fish passage barrier inventory and correction program in Jefferson County within the following guidelines.

The Department of Fish and Wildlife (WDFW) proposes to conduct a comprehensive inventory of County owned roadways to identify barriers to fish passage, evaluate passage up to each barrier, and assess the quantity and quality of habitat to be gained by correction. Inventory information would be used as input for a priority index formula that produces a priority index number (PI) that can be used to prioritize barrier correction efforts. The PI would be used as a general guideline along with other relevant factors to select projects that are mutually acceptable for correction work. WDFW proposes to conduct the inventory work at no cost to the County and would customize inventory methods to utilize existing county roadway identification protocol.

WDFW proposes to provide \$50,000 annually for barrier correction work on Jefferson County owned barriers. These dollars would be offered on a 50% cost share arrangement where WDFW provides project design, permitting, and construction work and the County reimburses WDFW for at least 50% of the project cost. The specific arrangement for each project would be

Klara Fabry
October 29, 1996
Page 2

expressed in a contract that clearly identifies the barrier correction work and how the work will be conducted. A copy of the Holiday Valley Road crossing of Schneider Creek Fish Passage Agreement with Thurston County is enclosed as an example agreement. Once a project is completed, the County would assume maintenance for the project and maintain it so as to be passable to fish. In cases where the project is conducted on lands off the existing County owned right-of-way, the County would acquire necessary property rights required to conduct maintenance of the project.

In addition to the dedicated funding we would ask that the County integrate barrier correction into its road planning activities to facilitate correction of barriers that are associated with road maintenance and construction work. This would require long range planning and budgeting efforts necessary to integrate fish passage work into future road projects. It is understood that both the County and WDFW participation would be subject to the availability of funds.

Please consider our proposal and provide a response back to me by December 16, 1996. If you would like to discuss our proposal further please call me (360-902-2527) or Larry Cowan (360-902-2557).

Sincerely,

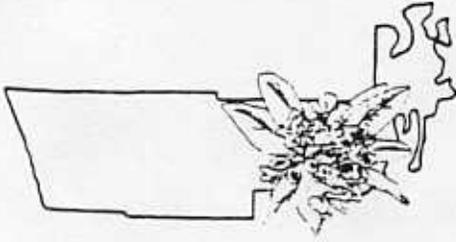


Paul Sekulich
Division Manager
Salmonid Screening, Habitat Enhancement and Restoration Division

PS:mjf

Enclosures (2)

cc: Elyse Kane
Gene Tillett
Larry Cowan
Daryl Erfle - Jefferson County Public Works



JEFFERSON COUNTY DEPARTMENT OF PUBLIC WORKS

P.O. Box 2070
1322 Washington St.
Port Townsend, WA 98368
(360) 385-9160

Klara A. Fabry, Director/County Engineer

January 23, 1997

RECEIVED

JAN 27 1997

WDFW
LANDS & RESTORATION SERVICES

Paul Sekulich, Division Manager
State of Washington
Department of Fish & Wildlife
Salmonid Screening, Habitat Enhancement and Restoration Division
600 Capitol Way N.
Olympia, WA 98501-1091

Subject: Fish Passage Barrier Inventory and Correction Program Proposal

Dear Mr. Sekulich:

Jefferson County (County) is certainly aware of possible fish passage barriers at county road crossings and in addressing this issue is interested and agreeable to the proposal from Washington State Department of Fish & Wildlife (WDFW) to collaborate and identify and correct identified barriers.

The County has been aware of this program offered by WDFW and has already accomplished portions of the proposal. The county has conducted a partial inventory and rating of drainage structures and forwarded the existing information to Larry Cowan, Fish Passage Coordinator, WDFW. A survey of suspected barriers to salmon migration was conducted by Larry Cowan and Tom Burns, (WDFW) and Peter Bahls, (Port Gamble S'Klallam Tribe) in July of 1995 and barriers were identified and prioritized and the County has been actively seeking funds to correct those identified barriers.

The County Maintenance Division Budget includes road repair funds for replacement of inadequate and/or damaged/deteriorating road drainage structures.

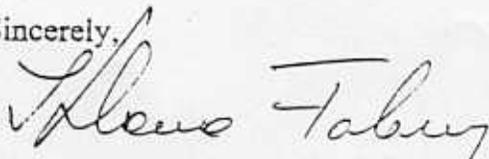
The above referenced structures, as well as financial considerations, would be factors the county must consider for prioritizing and final selection of projects under this agreement.

In a continuing effort addressing the fish passage barrier issues, the County accepts the WDFW Proposal and is anticipating working with WDFW, as well as other agencies, in a collaborative effort to identify and correct fish passage barriers.

Paul Sekulich
December 12, 1996
Page 2

The proposal letter dated October 29, 1996, stated that copies of the January 1995 progress report for the Washington State Department of Transportation fish passage effort and the Holiday Valley Road crossing of Schneider Creek Fish Passage Agreement with Thurston County were enclosed. These copies were NOT enclosed and the county would appreciate receiving the copies for informational purposes.

Sincerely,

A handwritten signature in cursive script that reads "Klara A. Fabry". The signature is written in dark ink and is positioned to the right of the word "Sincerely,".

Klara A. Fabry, P.E.
Public Works Director/County Engineer

cc: Jefferson County Board of County Commissioners
Port Gamble S'Klallam Tribe

APPENDIX C

Road Inventory List

Jefferson Co. Culvert Index County Roads to Drive

FILE= ANSWE

PAGE 1

NUMBER	DRIVE	NAME	LENGTH	INTERSECT	AT M.P.
10750		CLEARWATER RD.	4.13	SR101	R-146.92
12880		LOWER HOH RD.	1.9	SR101	L-167.59
13430		OIL CITY RD.	10.98	SR101	L-177.34
14680		DOWANS CREEK RD.	2.49	SR101	R-183.97
15000		UNDIE RD.	1.45	Co.BoY.	N/A
20430		FOREST DR.	.6	SR101	R-314.37
20770		CANAL LN.	.24	SR101	R-310.83
21720		ELK CT. W.	.06	218009	R-0.45
21800		ELK DR.	.5	220509	L-0.17
21820		ELK CT. E.	.06	220509	R-0.17
22740		DUCKABUSH RD.	3.66	SR101	R-310.02
24200		MT. JUPITER RD.	.22	SR101	R-309.50
24260		BLACK POINT RD.	2.04	SR101	L-309.41
25000		DOSEWALLIPS RD.	6.81	SR101	R-306.07
25140		BRINNON CEMETERY RD.	.04	251109	R-0.04
25150		ROCKY BROOK RD.	.43	250009	R-1.08
26290		SEAL ROCK RD.	.74	SR101	L-304.28
26950		WA WA POINT RD.	.6	271109	L-0.05
27110		HJELVICK RD.	.48	273409	R-0.01
27340		BEE MILL RD.	2.32	SR101	L-303.11
27770		SPENCER CREEK RD.	.74	SR101	L-301.66
27910		BUCKHORN RD.	.23	SR101	L-300.66
30110		RODGERS ST.	.33	SR101	L-294.77
30120		MUNCIE AVE.	.34	301109	L-0.32
30390		PENNEY CREEK RD.	4.56	SR101	R-296.13
30570		BIG QUILCENE RIVER RD.	1.91	303908	L-1.46
32750		EAST QUILCENE RD.	4.43	931507	L-14.58
33010		LINDSAY HILL RD.	4.07	327508	L-1.83
33280		BROAD SPIT RD.	.78	330109	L-1.19
33360		OLD LINDSAY HILL RD.	.33	330109	L-0.83
33700		CEMETERY RD.	.51	SR101	R-294.00
33750		SHADY LN.	.38	337009	L-0.51
34040		WILDWOOD RD.	.54	SR101	R-293.56
34230		LORDS LAKE LOOP RD.	5.48	SR101	R-292.74
34330		BOULTON RD.	1.27	SR101	R-286.74
34350		LELAND VALLEY RD. E.	1.3	SR101	L-287.83
34370		LELAND VALLEY RD. W.	4.13	SR101	R-289.00
34650		LONE STAR RD.	.45	348808	L-4.85
34750		CARL JOHNSON RD.	1.29	425309	R-0.21
34880		DABOB RD.	5.23	931507	L-7.74
35570		TARBOO LAKE RD.	2.9	931507	R-9.63
35750		OLD TARBOO RD.	1.01	931507	L-9.74
40150		DONALD RD.	.25	403908	L-14.97
40390		COYLE RD.	14.97	425309	L-0.44
40910		THOUSAND TRAILS RD.	.98	409009	L-0.30
41100		W. GO-ONNA DR.	.12	403908	R-13.05
41870		THORNDYKE RD.	8.52	447608	R-1.56
42200		CAMP DISCOVERY RD.	.86	403908	R-5.56
42530		DABOB POST OFFICE RD.	2.07	348808	L-3.17
50020		W. UNCAS RD.	2.01	SR101	R-283.91
50030		CASSELARY RD.	.32	500209	R-0.31
50110		OLD GARDINER RD.	1.78	502709	R-0.06
50140		OLD GARDINER RD.	3.86	SR101	L-274.61
50170		RONDELAY RD.	.53	502009	L-0.25
50200		GARDINER BEACH RD.	2.23	SR101	L-276.12

NUMBER	DRIVE	NAME	LENGTH	INTERSECT	AT M.P.
50300		LARSON LAKE RD.	4.06	931507	L-4.89
50360		PARADISE BAY RD.	6	569908	L-9.42
50500		HUCKLEBERRY LN.	.26	505309	L-3.13
50530		TEAL LAKE RD.	3.46	503609	R-1.52
50540		SHINE RD.	2.34	SR104	R-11.48
50610		FAIRMOUNT BEACH RD.	.03	503209	L-0.98
50710		PETERSON RD.	.76	508009	R-1.22
50800		OLD EAGLEMOUNT RD.	1.95	510508	R-1.44
50820		LUDLOW BAY RD.	1.18	503609	L-1.26
51050		EAGLEMOUNT RD.	5.34	SR20	R-1.83
51280		EMBODY RD.	.39	SR19	L-3.14
51320		N. SANDY SHORE RD.	.54	503008	L-0.93
51370		WERNER RD.	.68	514009	R-2.25
51400		SWANSONVILLE RD.	3.21	SR19	R-4.31
51410		WEST VALLEY RD.	5.51	SR19	L-9.56
51600		EGG & I RD.	3.27	514109	L-4.54
51750		GIBBS LAKE RD.	2.05	514109	R-3.98
51900		BEAUSITE LAKE RD.	.71	514109	R-2.97
52000		VAN TROJAN RD.	2.27	514109	R-1.03
52340		ANDERSON LAKE RD.	2.77	SR20	R-3.68
52840		LOPEMAN RD.	.22	932507	R-0.50
56850		OLD OAK BAY RD.	.47	569908	L-2.11
56990		OAK BAY RD.	9.94	SR116	R-1.98
60150		S. DISCOVERY RD.	4.42	601517	C-0.42
60151		S. DISCOVERY RD.	.42	SR20	L-9.83
61750		BECKETT POINT RD.	1.26	622808	R-4.82
62280		CAPE GEORGE RD.	7.55	601508	R-0.68
68060		PROSPECT AVE.	1.38	SR19	R-12.46
68240		RIDGEVIEW DR.	.25	682109	R-0.41
68320		AIRPORT RD.	.28	SR19	L-12.96
68541		OLD FORT TOWNSEND RD.	.53	SR20	R-8.27
69571		S. 8TH ST.	.42	698619	R-0.25
69861		MILL RD.	.77	SR20	R-9.83
91160		QUINAULT-SOUTH SHORE RD.	4.11	Co.Bdy.	N/A
91420		UPPER HOH RD.	12.04	SR101	R-178.50
93150		CENTER RD.	15.01	932507	C-1.57
93250		CHIMACUM RD.	1.57	933507	C-1.93
93350		IRONDALE RD.	1.93	SR19	R-11.64

APPENDIX D

Jefferson County Culvert Inventory - Field Data Description and Sequencing

Material - menu: NDC - no data collected(default)
PCC - precast concrete
CST - corrugated steel
CAL - corrugated aluminum
SPS - structural plate steel
SPA - structural plate aluminum
CPC - cast in place concrete
PVC - plastic
TMB - timber
MRY - masonry
OTH - other (attach note to describe)

Coating - menu: NDC - no data collected (default)
NON - none
GAL - galvanized
BIT - bituminous (asphalt)
EPX - epoxy
FBG - fiberglass
CON - concrete (on PCC or CPC pipes use NON)
POL - polymeric
OTH - other (attach note to describe)

Span/Diameter - key in - inside dimension in feet to the nearest 1/10th

Rise - key in - inside dimension in feet to the nearest 1/10th

Length - key in - round to nearest foot

Maintenance needed - menu: No (default)
Yes (attach note to describe)

Problem - menu: NDC - no data collected (default)
Outfall Drop
Velocity
Sheetflow
Hydraulic jump
Blockage
Other (attach note to describe)

Cause - menu: NDC - no data collected (default)
Undersized
Slope
Debris
Other (attach note to describe)

Slope (%) - key in

CulH2ODepth (water depth in culvert) - key in - feet to the nearest 1/10th

Outfall drop - key in - feet to the nearest 1/10th

PPLength - key in - feet to the nearest 1/10th

PPWetWidth - key in - feet to the nearest 1/10th

PPOHWWidth - key in - feet to the nearest 1/10th

PPMaxDepth - key in - feet to the nearest 1/10th

PPTailDepth - key in - feet to the nearest 1/10th

PPDomSub(dominant substrate) - menu: NDC - no data collected (default)
Gravel
Rubble
Sand
Boulder

PPSubDom (subdominant substrate) - menu: NDC - no data collected (default)
Sand
Gravel
Rubble
Boulder

ChannelWidth - key in - width of stream, in feet to nearest 1/10th, at second riffle downstream of culvert

Skew - key in - angle of flow into culvert in degrees, R or L looking upstream

FillDepth - estimated depth of road fill in feet

Headwall - menu: NDC - no data collected (default)
None (default)
Upstream end
Downstream end
Both

Wingwall - menu: NDC - no data collected (default)
None (default)
Upstream end
Downstream end
Both

Apron - menu: NDC - no data collected (default)
None (default)
Upstream end
Downstream end
Both

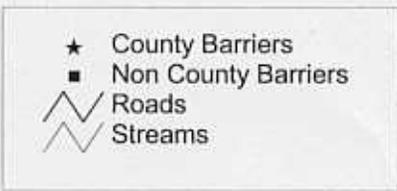
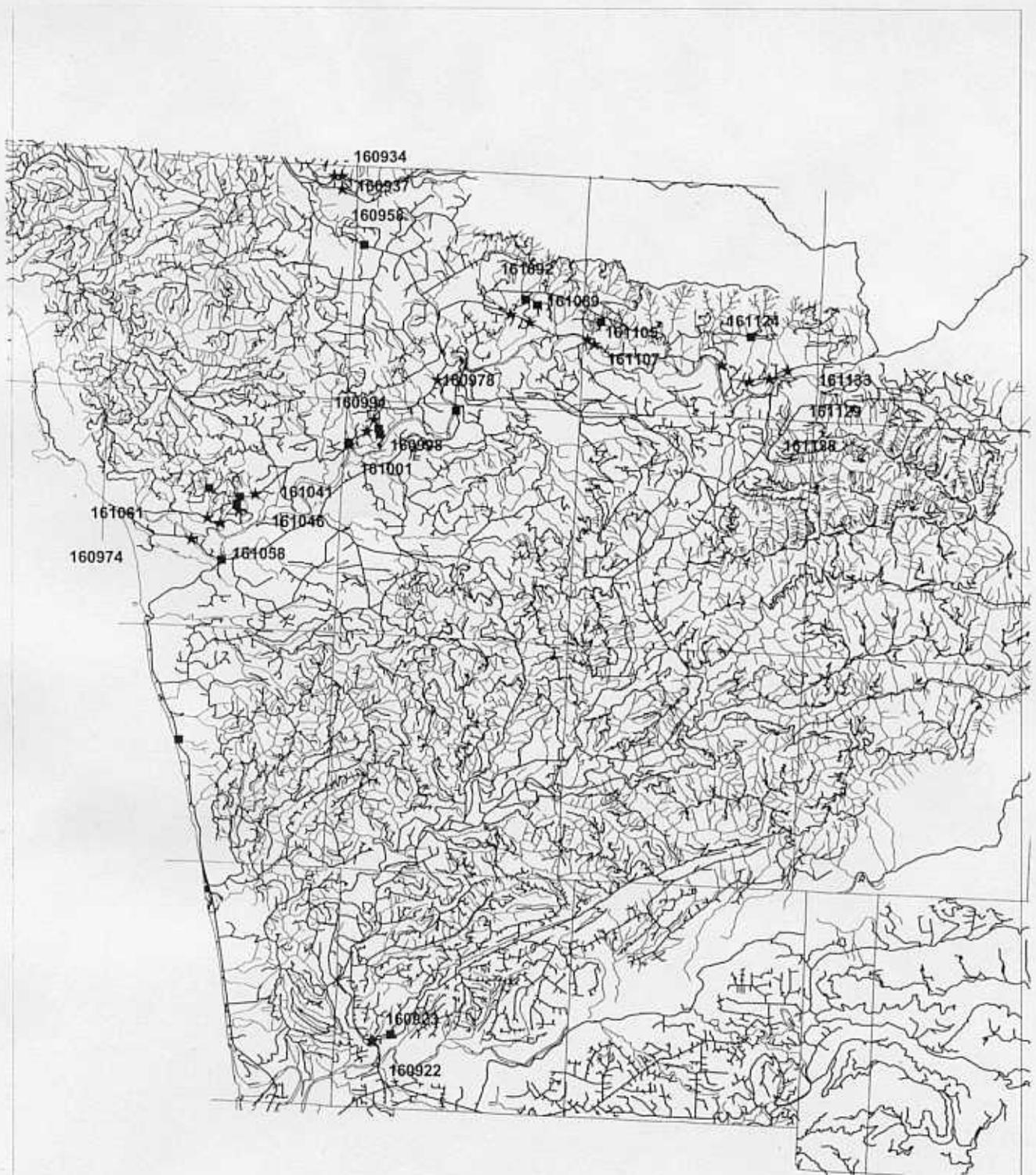
Photo No - key in - numeric

APPENDIX E

Maps of Jefferson County Barrier Culverts



East Jefferson County Barrier Culverts



West Jefferson County Barrier Culverts